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Conference Abstract

New Requirements of Biodiversity Research for Metadata on Models and Sensors on the Internet of Things and Big Data Era

Wilian França Costa[‡,§,|], Raquel Machado de Sousa[§], Tereza Cristina Giannini[‡,¶], Bruno de Carvalho Albertini[§], Antonio Mauro Saraiva[§]

‡ Instituto Tecnológico Vale, Belém, Brazil
§ Universidade de São Paulo, São Paulo, Brazil
| Universidade Presbiteriana Mackenzie, São Paulo, Brazil
¶ Universidade Federal do Pará, Belém, Brazil

Corresponding author: Wilian França Costa (wilianfc@gmail.com)

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Abstract

Important initiatives, such as the Convention on Biological Diversity's (CBD) Aichi targets, the United Nations' 2030 Agenda for Sustainable Development (and its Sustainable Development Goals) highlight the urgent need to stop the continuous and increasing loss of biodiversity. That requires an increase in the knowledge that will allow for sustainable use of natural resources. To accomplish that, detailed studies are needed to evaluate multiple species and regions. These studies demand great effort from professionals, searching for species and/or observing their behavior. In this case, the use of new monitoring devices could be beneficial in data collection and identification, optimizing the specialist effort to detect and observe species in-situ. With the advance of technology platforms for developing connected devices and sensors, associated with the evolution of the Internet of Things (IoT) concepts, and the advances of unmanned aerial vehicles (UAVs) and Wireless sensor networks (WSN), new scenarios in biodiversity studies are possible. The technology available now could allow studies applying relatively cheaper sensors with long-range (approx. 15 km), low power, low bit rate communication and up to

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10-year battery life, using a Low Power Wide Area Network (LPWAN) and with capacity to run bio-acoustic or image processing detection. Platforms like Raspberry Pi or any other with signal processing capabilities can be applied (Hodgkinson and Young 2016). Sensor technologies protocols applied in IoT networks are usually simple and flexible. Common semantics and metadata definitions are necessary to extract information and representations to construct complex networks. Some of these metadata definitions can be adopted from the current Darwin Core schema. However, Darwin Core evolved based on enterprise technologies (i.e. XML) and relational database definitions, that usually need machines with significant bandwidth to transmit data. Today the technology scenario is taking another route, going from centralized to distributed architectures, occasionally applying non-relational and distributed databases, ready to deal with synchronization and eventual consistency problems. These distributed databases are usually employed to construct complex networks, where relation restrictions are not mandatory or, sometimes, even desired (Baggio et al. 2016). With these new techniques becoming a reality in biodiversity conservation studies, new metadata definitions are necessary. Those new metadata need to standardize and create a shared vocabulary that includes requirements for devices information exchange, data analytics, and model generation. Also, these new definitions could aggregate the Essential Biodiversity Variables (EBVs) concepts, that aim to identify the minimum of variables that can be used to inform scientists, managers and decision makers (Haase et al. 2018). For this reason, we propose the insertion of EBV definitions in the construction of sensor integration metadata and models characterization inside the Darwin Core metadata definitions (Fig. 1).

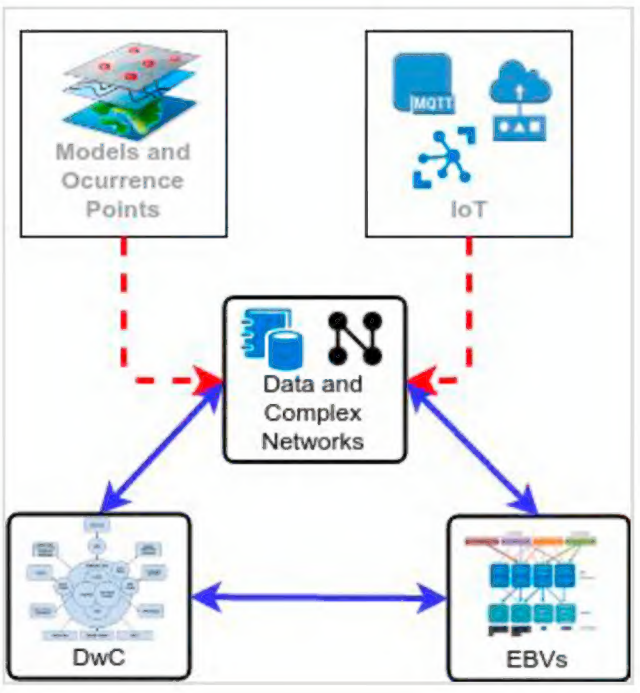

Figure 1.

The relationship between models, IoT, EBVs and Darwin Core. All concepts are correlated and need to be integrated in a common metadata definition in the biodiversity domain.

Keywords

Biodiversity, IoT, EBV, Sensor Networks, Model Metadata

Presenting author

Wilian França Costa

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